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Project: Stonebrook Subdivision

Geotechnical Completion Report Stages 14 and 15

Reference: 224926

Prepared for: CDL Land New Zealand Ltd.

Revision: 1

23 April 2015

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Document Control Record

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Approval					
Author Signature		Verifier Signature		Approver Signature	
Name	T. Mitchell	Name	R. Heritage	Name	J. Kupec
Title	Geotechnical Engineer	Title	Senior Geotechnical Engineer CPEng No. 1000332	Title	Technical Director

Contents

Appendices

1. Executive Summary

CDL New Zealand Limited is developing Stages 14 and 15 of the Stonebrook Subdivision, located between Main South Road and Burnham School Road in Rolleston, south west Christchurch. As part of this work, a geotechnical completion report is required to certify that the site works have been carried out to the required standard. This report describes earthworks involved with Stages 14 and 15 of the Stonebrook Subdivision comprising:

Stage 14 - Lots 219 to 226, 265 to 268 and 449 to 452;

Stage 15 - Lots 262 to 264, 269 to 278, 293, 447, 448, 453 and 454.

Geotechnical testing carried out as part of the subdivision consent stage indicated that the Stonebrook Subdivision is classified as Technical Category 1 (TC1) with a deep groundwater table and geotechnically competent gravels at shallow depths.

Earthworks to form the subdivision including cutting and filling have occurred on the site. The quality assurance (QA) testing of the earthfill indicates that 95% of Maximum Dry Density or greater compaction levels were consistently achieved and we believe that earthfill placed within the Stages 14 and 15 has achieved the required compaction levels as per intent and definition of NZS4431:1989.

From the testing undertaken as part of the development of the Stage 14 and 15 areas the following is concluded:

- Bulk earthworks meet the earthworks specifications, including NZS4431:1989.
- In line with our subdivision consent assessment, the site is likely to perform to the level of TC1 equivalent.
- As the land is likely to perform to a level of TC1, and the lots are underlain by earthfill that has achieved the required compaction, we consider NZS 3604:2011 type foundations will be suitable for light weight timber frame buildings.
- The usual investigations and site observations will be required for the building consent and construction phases.

This report shall be read as a whole. Our limitations are presented in Section 7.

2. Introduction

2.1 Geotechnical Completion

CDL Land New Zealand Limited is developing Stages 14 and 15 of the Stonebrook Subdivision, located on Burnham School Road, Rolleston (See Figure 1 in Appendix A). The site works on Stages 14 and 15 have included bulk earthworks. As part of the work, a geotechnical completion report is required to certify the site works have been carried out to the required standard and to provide recommendations for building development.

This report has been prepared for CDL Land New Zealand Limited and Selwyn District Council. It describes earthworks within Stages 14 and 15 of the Stonebrook Subdivision (See Figure 2 in Appendix A).

The purpose of the geotechnical completion report is to present the following:

- A summary of previous investigation information carried out as part of subdivision consent investigations and detailed design;
- A summary of the ground conditions;
- The extent of earthworks on the lots and compliance testing of bulk earthworks;
- A summary of the findings and recommendations for residential building development.

This report has been prepared based upon known geotechnical data and compaction testing undertaken during and after earthworks construction. All references to cut/fill depths are based on the early 2012 ground levels.

This report shall be read as a whole. Our limitations are presented in Section 7.

2.2 Site Description

The Stonebrook subdivision is located south west of the Rolleston town centre and covers an area of approximately 42ha. The site has been divided into 23 stages between Main South Road to the north and Burnham School Road to the south. This report relates to Stages 14 and 15 which are essentially flat and currently vegetated with grass.

3. Pre-Development Geotechnical Work

3.1 Geotechnical Investigations

The subdivision consent and detailed geotechnical design for the subdivision included a series of geotechnical investigations comprising a desktop study, test pits and boreholes. The details of these investigations are presented in the Aurecon report issued on 1 November 2011, titled *"Brookside Road Subdivision, Geotechnical Report" (Aurecon, 2011).*

The type and number of investigations is presented in Table 1 below.

Table 1: Subdivision Consent Investigations

Type of Investigation	Number of Investigations
Test Pits	64
Borehole with SPT at 1.5m centres	2

3.2 Ground Conditions

From the geotechnical investigations the ground conditions within Stages 14 and 15 are summarised in Table 2.

Table 2: Typical ground conditions within the Stages 14 and 15

Depth to Top of Unit (m)	Depth to Base of Unit (m)	Soil Unit
0	0.15 to 0.35	TOPSOIL: dark brown, SILT.
0.15 to 0.35	>60	Alluvium: brownish grey GRAVEL and Sandy GRAVEL with occasional silt, clay and sand lenses.

Groundwater levels ranged from 10.3m to 13.1m below ground level. During the site earthworks the ground conditions summarised in Table 2 were typically encountered and groundwater was not encountered within the depth of interest.

3.3 Liquefaction Potential

No evidence of liquefaction such as sand boils or other surface manifestations were encountered following earthquakes in the Canterbury region since September 2010 based on observations on site during investigations and According to Environment Canterbury (ECan), the Stonebrook Drive Subdivision has been assessed as "*damaging liquefaction unlikely*" in future earthquake events (ECan, 2013). This lack of evidence is consistent with a deep water table and the dense nature of the sand and gravel underlying the site.

4. Subdivision Earthworks

4.1 General

Bulk earthworks for Stages 14 and 15 of Stonebrook Subdivision were carried out in accordance with NZS4431:1989 "*Code of Practice for Earthfill for Residential Development*" and the Selwyn District Council Resource Consent Decisions: 145543 and 145544 (Selwyn District Council, 2014). The works comprised regrading of the site contours for the residential lots by engineered filling and cutting.

4.2 Areas of Cut and Fill

Site earthworks within the Stages 14 and 15 allotments comprised filling and cutting up to 0.7m. Tables 3 and 4 below shows lots which have been cut or filled within Stages 14 and 15, respectively. The engineered fill comprises onsite natural gravel and has been compacted with a double drum roller. A layer of topsoil has been spread over the engineered fill.

We understand that the gravel fill originally placed across Stages 14 and 15 was sourced from a gravel stockpile within Stage 17. A second layer of onsite fill was placed over parts of Lots 224, 225, 265, 267 272 and 273, to build up the ground level to meet subdivision requirements. The fill placed for the second layer comprised onsite gravel fill from various stockpiles across the wider subdivision.

The extent of cutting and filling is shown on Figure 3 in Appendix A.

Table 3: Areas of Cut and Fill Stage 14

Earthwork	Lot Number
Fill	219, 221, 224, 225, 265, 267, 449 to 451
Cut	219 to 223, 225, 226, 266 to 268, 449 to 452

Table 4: Areas of Cut and Fill Stage 15

Earthwork	Lot Number
Fill	262, 263, 269, 272 to 276, 293, 453 and 454
Cut	264, 269 to 271, 277, 278, 447 and 448

4.3 Compaction Quality Control Testing

Independent testing of earthfill compaction was carried out by City Care Limited Laboratory (City Care) using a Nuclear Densometer (NDM). The acceptance criteria was based on the Selwyn District Council earthworks specification as follows:

- Compaction of fill is to be in accordance with NZS 4431: 1989 *"Code of Practice for Earthfill for Residential Development"*.
- Compaction standard is 95% Maximum Dry Density (MDD) for all areas in accordance with NZS4402:1986 "*Methods of Testing Soils for Civil Engineering Purposes*".

The location of the soil sample obtained for laboratory compaction testing was located within Stage 17 (Test Site E). The first lift of fill placed on lots which have been filled within Stage 14 was sourced from the stockpile within Stage 17. The remainder of the lifts on lots which required more than one lift were sourced from various remaining stockpiles across the wider subdivision. The results of the nuclear density tests were compared to the corresponding compaction test maximum dry density to confirm the adequacy of the site compaction. The locations of compaction tests and compaction test result are shown on Figure 2

Stage 14 Filling

City Care carried out ten nuclear density tests on lots within Stage 14. The fill was generally placed in a single lift with exception to Lots 265 and 267 where fill was placed in two lifts. NDM testing was carried out following each lift. We understand that fill placed on Lots 224 and 225 and on Lots 265 and 267 in the second lift was sourced from various stockpiles of onsite gravel and the NDM test results have been compared to a maximum dry density of 2220kg/m^3 as we understand that the fill was a mixture of gravel with Maximum Dry Densities between 2120kg/m^3 and 2250kg/m^3. Fill placed on Lots 221, 449, 450, 451 and the first lift on Lots 265 and 267 was sourced from a stockpile of onsite gravel located in Stage 17, south of Stage 14 and NDM test results were compared to a maximum dry density of 2140kg/m^3. The compaction test results and the compaction curve for Test Site F (located within Stage 17) is presented in Appendix B.

Stage 15 Filling

City Care carried out nine nuclear density tests on lots within Stage 15. The fill was generally placed in a single lift with exception to Lot 272 and 273 where fill was placed in two lifts, and NDM testing carried out following each lift. We understand that fill placed in the second lift on Lots 272 and 273 was sourced from various stockpiles of onsite gravel and the NDM test results have been compared to a maximum dry density of 2220kg/m^3 as we understand that the fill was a mixture of gravel with Maximum Dry Densities between 2120kg/m^3 and 2250kg/m^3. The fill placed across remainder of the lots and on the first lift placed on lots 272 and 273 was sourced from a stockpile of onsite gravel located in Stage 17, south of Stage 14 and NDM test results were compared to the maximum dry density of 2140kg/m^3 as determined based on testing of samples from this stockpile. The compaction test results and the compaction curve for Test Site F (located within Stage 17) is presented in Appendix B.

4.4 Compaction Results

The results presented in Appendix C indicate that 95% MDD or greater compaction has generally been achieved with exception to one test on Lot 265. The area has been re-tested and the results indicate that adequate compaction has mostly been achieved. We consider that all the earthfill placed within Stages 14 and 15 has achieved the required compaction.

4.5 Certification

A statement of suitability of earth fill for residential development indicating the standard of bulk earthworks generally meet our earthworks specification and the applicable codes, including NZS4431:1989 is included in Appendix D.

5. Building Development

5.1 Technical Category

Geotechnical investigations including 64 test pits and two boreholes have been carried out by Aurecon as part of the wider subdivision development and encountered no potentially liquefiable material. The ECan/GNS report *"Review of liquefaction hazard information in eastern Canterbury and parts of Selwyn, Waimakariri and Hurunui Districts"* (ECan, 2013), identifies the site to be non-liquefiable. Therefore the lots within Stages 14 and 15 are likely to perform to the level of TC1 equivalent.

5.2 Earthworks on Building Lots

The extent of earthfill on Lots within Stages 14 and 15 is shown on Figure 3 in Appendix A.

The fill areas have been constructed using materials and processes that have been measured by independent testing. The testing shows that the placement of filling is generally in accordance with the specification.

5.3 Soil Suitability Criteria

Section 3 of New Zealand Standard NZS 3604:2011 "*Timber Framed Buildings not requiring specific Engineering Design*" provides several criteria for defining foundation soil suitability for lightweight timber framed residential buildings.

Clauses 3.1.3 and 3.3 provide criteria for determining strength and suitability of founding soils.

Clauses 3.4.1 and 3.4.2 discuss depths to founding. For purposes of this report, we have interpreted these clauses as meaning that for sound bearing at depths of 200mm to 600mm, standard shallow type foundations can be utilised. For undercut depths greater than 600mm, specific design will be required. This may include backfilling trenches with compacted gravel or 10MPa site concrete.

5.4 Building Considerations

As the land is likely to perform to a level of TC1 equivalent and some of the lots are underlain by earthfill that has achieved the required compaction, we consider NZS 3604:2011 type foundations are likely to be suitable provided they are founded below the topsoil.

We note that at the time of writing this report the location and structural form of the future dwelling on the lots are unknown, but we infer that a NZS 3604:2011 type lightweight timber framed houses will be constructed.

5.5 Future Earthworks

We do not anticipate that future earthworks will be required on the majority of the lots however should such work be required the following should be noted.

- All earthworks should be carried out in accordance with the Health and Safety and Employment Act 1992 and the Ministry of Building, Innovation and Employment (MBIE) approved Code of Practice for Safety in Excavations and Shafts for Foundations, 1995.
- Cuts that exceed 0.6m high around any of the house sites that support any loads must be retained by a suitable retaining wall designed by a Chartered Professional Engineer.
- We recommend that no more than 450mm of fill is placed on the allotment without detailed engineering design.

- If retaining walls are constructed across the site fill should only be placed well away from the dwelling, unless specifically designed.

Any development where excavations greater than 1.5m in depth are proposed, must be subject to specific investigation and design to confirm these works will have no adverse effect on land stability and/or structures on adjacent lots.

5.6 Stormwater

All stormwater collected by impermeable surfaces (dwelling and pavement) and grassed areas shall be collected by lined channel drains and sumps etc. and be piped away from the lots to discharge into the Council vested infrastructure.

5.7 Construction Observations

The suitability of foundation conditions must be verified at the time of construction (refer Requirements of NZS 3604:2011). Foundation inspections by a Building Inspector who is familiar with this report or a Chartered Professional Engineer is needed and must be carried out to ensure the adequacy of the foundation subgrade prior to the placement of granular hardfill or the construction of foundations.

6. References

Aurecon, 2011. *Brookside Road Subdivision, Geotechnical Report.* Aurecon New Zealand Ltd, Christchurch, New Zealand.

Environment Canterbury, 2013, *'Review of the liquefaction hazard in eastern Canterbury, including Christchurch City and parts of the Selwyn, Waimakariri and Hurunui Districts'*, Report No. R12/83

NZS 3604:2011. '*Timber Framed Buildings*.' Standards New Zealand, Wellington, New Zealand.

NZS 4402:1986. '*Methods of Testing Soils for Civil Engineering Purposes*.' Standards New Zealand, Wellington, New Zealand.

NZS 4431:1989. '*Code of practice for earth fill for residential development'*. Standards New Zealand, Wellington, New Zealand.

Occupational Safety and Health Service, 1995. '*Approved Code Of Practice For Safety In Excavation And Shafts For Foundations'.* Occupational Safety and Health Service, Department of Labour, Wellington New Zealand.

Selwyn District Council, 2014, '*Resource Consent Decision: 145543'.* Selwyn District Council, Rolleston, New Zealand.

Selwyn District Council, 2014, '*Resource Consent Decision: 145544'.* Selwyn District Council, Rolleston, New Zealand.

7. Limitations

We have prepared this report in accordance with the brief as provided. The contents of the report are for the sole use of the Client and no responsibility or liability will be accepted to any third party. Data or opinions contained within the report may not be used in other contexts or for any other purposes without our prior review and agreement.

This report has been prepared as part of the development of the Stonebrook Stage 14 Subdivision. It has been prepared to report on the management of the earthworks during construction, including compaction standards of fills.

This report does not remove the responsibility of the Owner / Builder / Building Certifier to satisfy themselves of foundation depth and suitability at the finally selected house location.

Subsurface conditions relevant to construction works should be assessed by experienced contractors and designers who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes. Subsurface conditions, such as groundwater levels, can change over time. This should be borne in mind, particularly if the report is used after a protracted delay or in wet weather.

It is strongly recommended that any plans and specifications prepared by others and relating to the content of this report, or amendments to the original plans and specifications, are reviewed by Aurecon to verify that the intent of our recommendations is properly reflected in the design. During construction we request the opportunity to review our interpretations if the exposed site conditions are significantly different from those inferred in this report.

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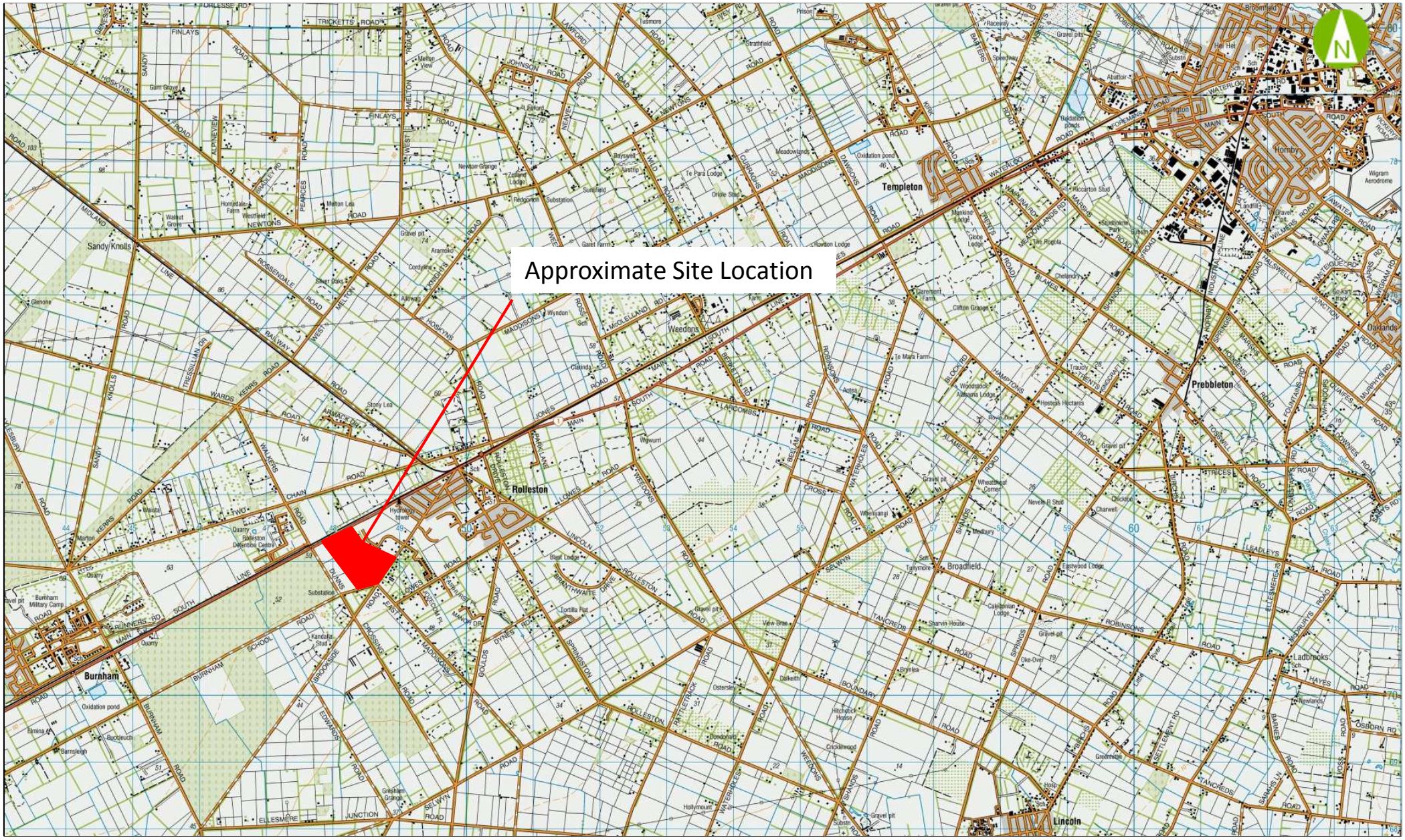
Appendix A

Figures



CLIENT	PRELIMINARY NOT FOR CONSTRUCTION	ALL DIMENSIONS APPROXIMATE ONLY	SCALE	SIZE	TITLE	REGIONAL SITE LOCATION PLAN					
			NTS	A4							
FIGURE	FIGURE 1		BY								
			T. MITCHELL		REFERENCE	BACKGROUND IMAGE SOURCED FROM LINZ CROWN COPYRIGHT RESERVED					
PROJECT	STONEBROOK SUBDIVISION STAGES 14 AND 15		APPROVED								
			R. HERITAGE								
			DATE		FIGURE No.	PROJECT	WBS	TYPE	DISC	NUMBER	REV
			24 APRIL 2015			224926	003	FIG	TRA	01	0

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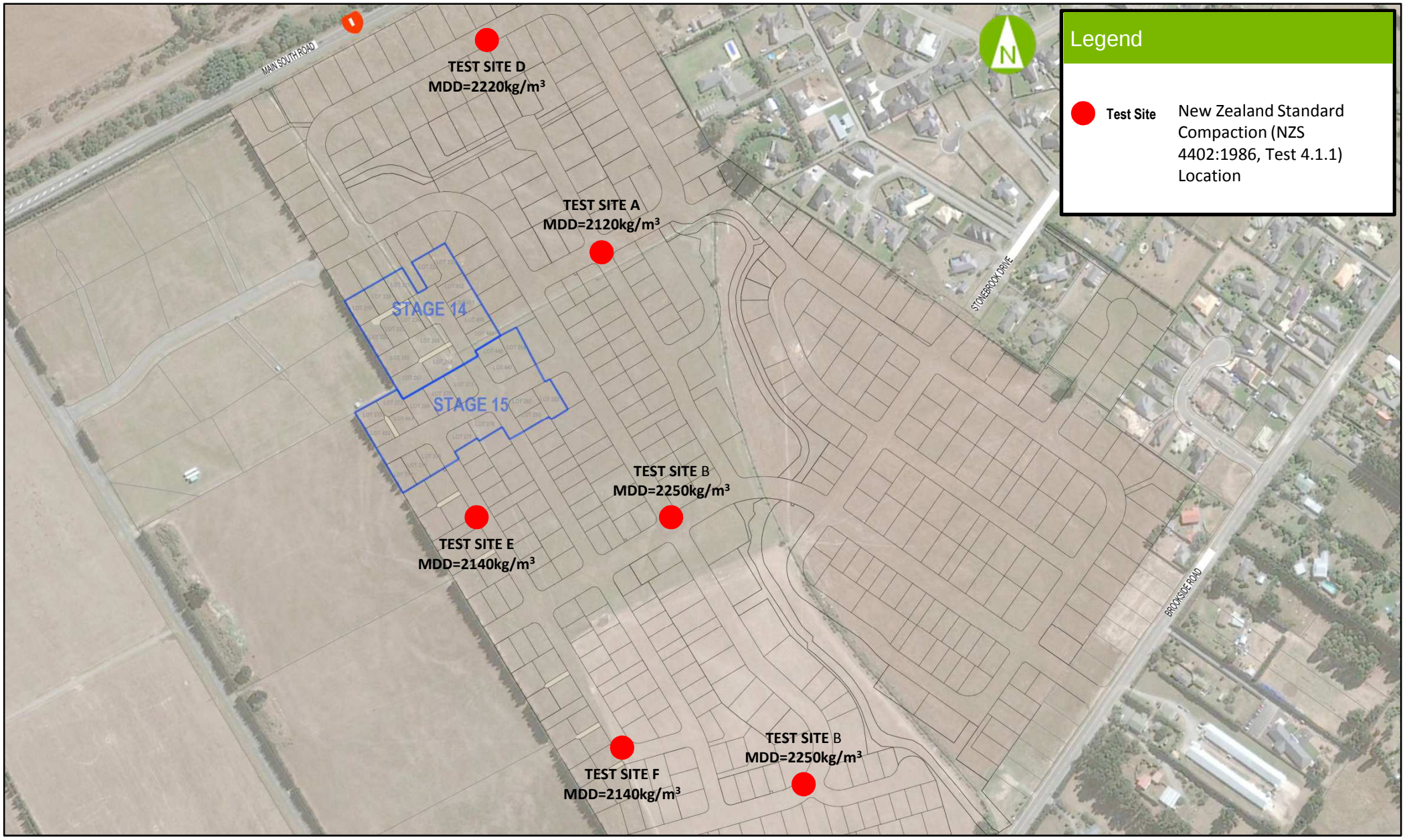

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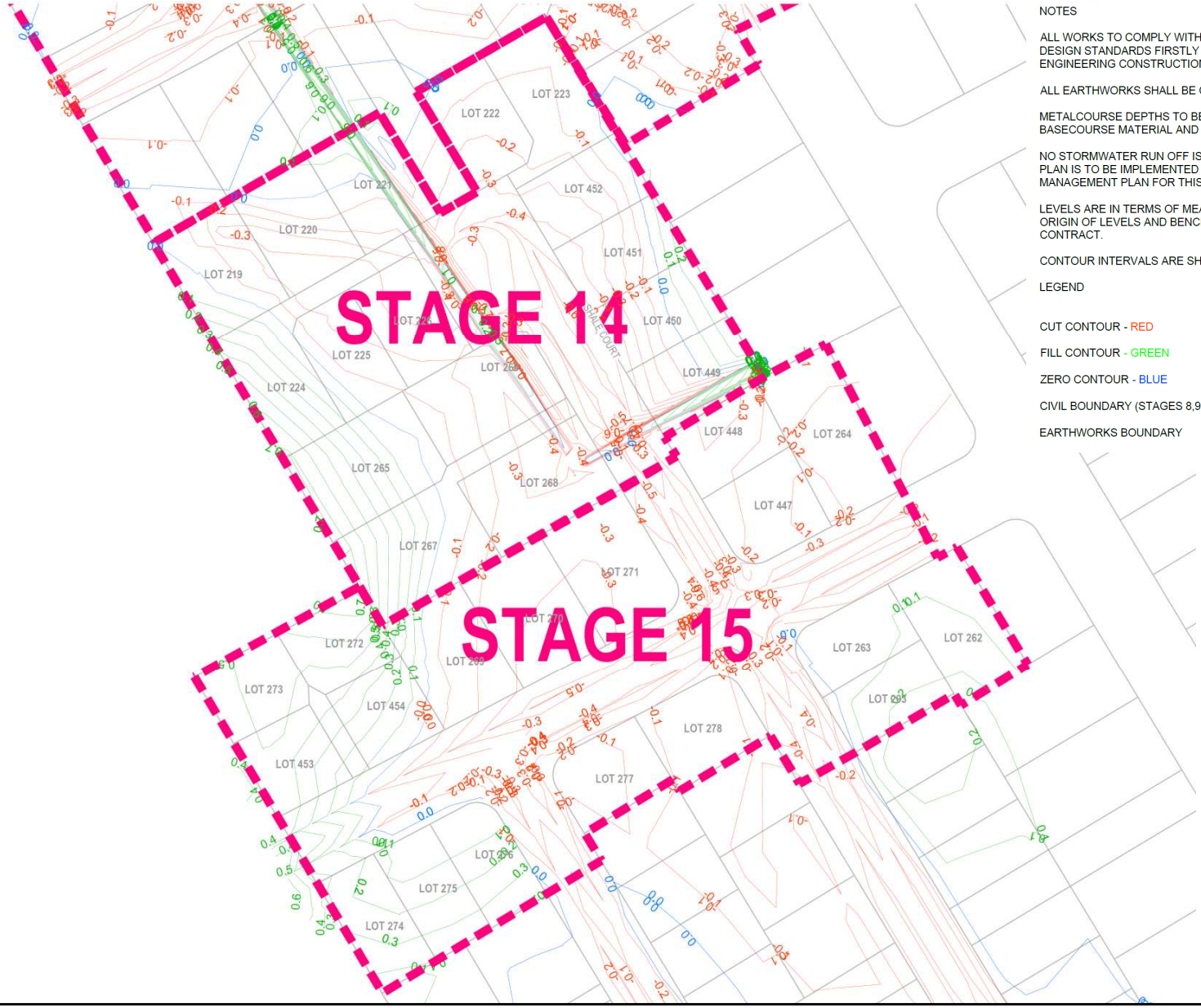
CLIENT	PRELIMINARY NOT FOR CONSTRUCTION	ALL DIMENSIONS APPROXIMATE ONLY	SCALE	SIZE	TITLE	STONEBROOK SUBDIVISION LAYOUT				
FIGURE	FIGURE 2		NTS	A4						
			BY		REFERENCE	BACKGROUND IMAGE SOURCED FROM AURECON DRAWING NO. LD-S2-CE-01				
			T. MITCHELL							
PROJECT	STONEBROOK SUBDIVISION STAGES 14 AND 15		APPROVED							
			R. HERITAGE							
			DATE		FIGURE No.	PROJECT	WBS	TYPE	DISC	NUMBER	REV
			24 APRIL 2015			224926	003	FIG	TRA	02	0



NOTES

ALL WORKS TO COMPLY WITH SELWYN DISTRICT COUNCIL INFRASTRUCTURE DESIGN STANDARDS FIRSTLY THEN CHRISTCHURCH CITY COUNCIL'S CIVIL ENGINEERING CONSTRUCTION STANDARD SPECIFICATIONS CSS: PARTS 1-7: 2010.

ALL EARTHWORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH NZS 4431:1989.

METALCOURSE DEPTHS TO BE CONFIRMED BY TESTING SUBGRADE PRIOR TO PLACING BASECOURSE MATERIAL AND CONFIRMED BY ENGINEER.

NO STORMWATER RUN OFF IS TO LEAVE THE SITE DURING EARTHWORKS, THE SEDIMENT CONTROL PLAN IS TO BE IMPLEMENTED TO COMPLY WITH THE EROSION AND SEDIMENT CONTROL MANAGEMENT PLAN FOR THIS PROJECT AND THE ECAN GUIDELINES

LEVELS ARE IN TERMS OF MEAN SEA LEVEL (1937) LYTLETON DATUM.
ORIGIN OF LEVELS AND BENCHMARKS TO BE PROVIDED BY ENGINEER AT THE START OF THE CONTRACT.

CONTOUR INTERVALS ARE SHOWN AT 0.1m

LEGEND

CUT CONTOUR - RED

FILL CONTOUR - GREEN

ZERO CONTOUR - BLUE

CIVIL BOUNDARY (STAGES 8,9 & 12)

EARTHWORKS BOUNDARY

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CLIENT	PRELIMINARY NOT FOR CONSTRUCTION	ALL DIMENSIONS APPROXIMATE ONLY	SCALE	SIZE	TITLE	EARTHWORKS STAGES 14 AND 15 CUT/FILL CONTOURS					
			NTS	A4							
FIGURE	FIGURE 3		BY								
			T. MITCHELL								
			APPROVED		REFERENCE	SOURCED FROM AURECON CUT AND FILL DRAWING					
			R. HERITAGE								
PROJECT	STONEBROOK SUBDIVISION STAGES 14 AND 15		DATE		FIGURE No.	PROJECT	WBS	TYPE	DISC	NUMBER	REV
			24 APRIL 2015			224926	003	FIG	TRA	03	0

Appendix B

Compaction Test Results

City Care Ltd Laboratory, 205 Springs Road, Christchurch 8042
T: 03 941 7616 F: 03 941 7618 www.citycare.co.nz

DETERMINATION OF THE DRY DENSITY / WATER CONTENT RELATIONSHIP
New Zealand Standard Compaction Test

Client: K B Contracting & Quarries Limited
Contact Name: Mr A. Hodgson

Sample Type: Sand and aggregate
Sample Source: Rolleston CDL, Test Site F

Sampled By: L. Sim, J. Bennett
Date Sampled: 20 January 2014
Tested By: L. Sim
Date of Test: 5 February 2014

Sample Method: Dug from hole at site specified by Client (sampling is not IANZ Accredited)
Test Method: NZS 4402:1986 Test 4.1.1(Standard Compaction)

Results:

Moisture Content (% by dry mass)	Wet Density (kg/m3)	Dry Density (kg/m3)
3.3	2010	1940
3.6	2020	1940
4.4	2060	1970
5.7	2100	1980
7.0	2200	2060
9.0	2310	2120
9.3	2340	2140

Maximum Dry Density could not be determined by this method.
Maximum Density achieved = 2140 kg/m3 @ 9.3%
Note: Natural Water Content = 5.7%

Sample History: Natural. Test performed on fraction <19.0mm

This report relates only to the sample tested and may only be reproduced in full.

Date of Issue: 18 February 2014

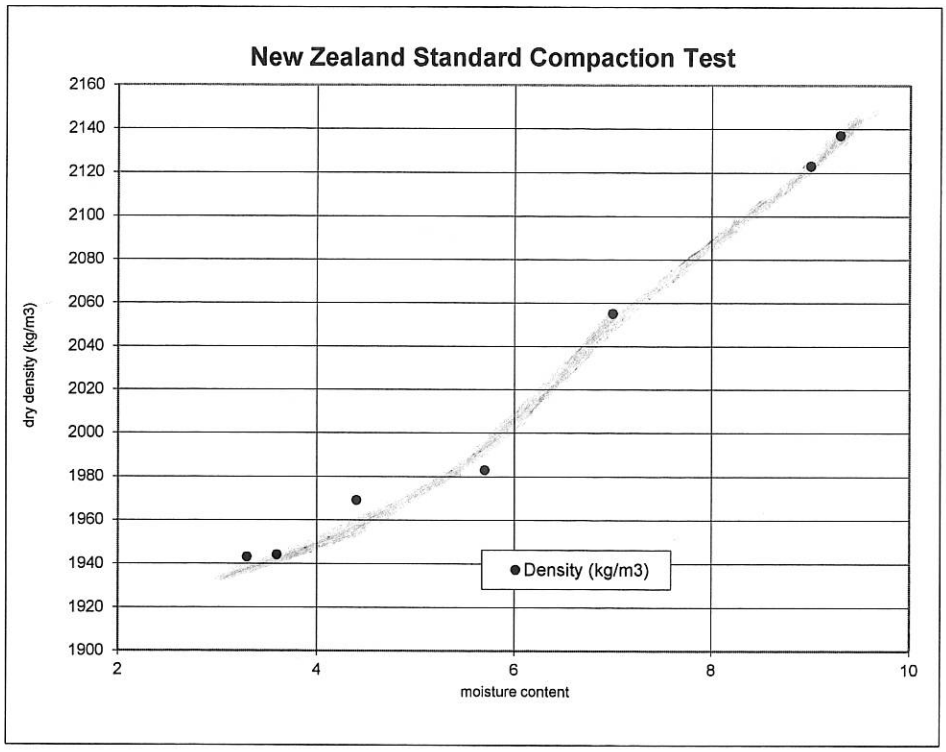
Approved Signatory: _____
(T. O'Regan, Laboratory Manager)

Checked By: _____

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
new zealand accredited laboratory

DETERMINATION OF THE DRY DENSITY / WATER CONTENT RELATIONSHIP
New Zealand Standard Compaction Test

le Type: Sand and aggregate
le Source: Rolleston CDL, Test Site F



This report relates only to the sample tested and may only be reproduced in full.

Appendix C

Nuclear Density Test Results

Test results supplied by City Care for K B Construction and Quarries Ltd and reproduced by Aurecon for the Stonebrook Subdivision Stages 14 and 15 Geotechnical Completion Report.

The material comprising onsite gravel was tested in accordance with NZS 4407:1991 Test 4.2.2 (backscatter mode).

Table 1 Stonebrook Subdivision Stage 14 Nuclear Densometer Test Results (15 October 2014)

Lot Number	Dry Density (kg/m^3)	Wet Density (kg/m^3)	Moisture (%)	Compaction (%)
Lift 1 of 2 Target Density 2140kg/m^3				
265	2130	2280	7.0	99.5
267	2120	2270	7.0	99.1

Table 2 Stonebrook Subdivision Stage 14 Nuclear Densometer Test Results (3 February 2015)

Lot Number	Dry Density (kg/m^3)	Wet Density (kg/m^3)	Moisture (%)	Compaction (%)
Lift 1 of 1 Target Density 2220kg/m^3				
224	2190	2300	4.5	98.6
225	2200	2300	4.0	99.1
Lift 2 of 2 Target Density 2220kg/m^3				
265	2050	2170	6.0	92.3
267	2110	2200	4.5	95.0

Table 3 Stonebrook Subdivision Stage 14 Nuclear Densometer Test Results (9 April 2015)

Lot Number	Dry Density (kg/m^3)	Wet Density (kg/m^3)	Moisture (%)	Compaction (%)
Lift 1 of 1 Target Density 2140kg/m^3				
221	2040	2140	5.0	95.3
449	2100	2280	8.5	98.1

Table 4 Stonebrook Subdivision Stage 14 Nuclear Densometer Test Results (22 April 2015)

Lot Number	Dry Density (kg/m^3)	Wet Density (kg/m^3)	Moisture (%)	Compaction (%)
Lift 2 of 2 Target Density 2220kg/m^3				
265*	2110	2230	6.0	95.0
267*	2110	2210	4.5	95.0

* - Re-test of 3 February 2015 NDM tests on Lots 265 and 267

Table 5 Stonebrook Subdivision Stage 15 Nuclear Densometer Test Results (15 October 2014)

Lot Number	Dry Density (kg/m^3)	Wet Density (kg/m^3)	Moisture (%)	Compaction (%)
Lift 1 of 2 Target Density 2140kg/m^3				
272	2130	2270	6.5	99.5
273	2140	2280	7.0	100.0

Table 6 Stonebrook Subdivision Stage 15 Nuclear Densometer Test Results (3 February 2015)

Lot Number	Dry Density (kg/m^3)	Wet Density (kg/m^3)	Moisture (%)	Compaction (%)
Lift 2 of 2 Target Density 2220kg/m^3				
272	2220	2330	5.5	100.0
273	2290	2400	5.0	103.2

Table 7 Stonebrook Subdivision Stage 15 Nuclear Densometer Test Results (20 April 2015)

Lot Number	Dry Density (kg/m^3)	Wet Density (kg/m^3)	Moisture (%)	Compaction (%)
Lift 1 of 1 Target Density 2140kg/m^3				
274	2130	2270	6.5	99.5
275	2170	2310	6.5	101.4
276	2040	2200	7.5	95.3
453	2100	2220	5.5	98.1
454	2110	2260	7.0	98.5

Notes: Fill placed across Lots 224, 225 and on the second lift on Lots 272, 273, 265 and 267 was sourced from various stockpiles of onsite gravel fill with an unknown maximum dry density and the NDM test results have been compared against a maximum dry density (target density) of 2220 kg/m^3 in these areas. Fill placed across the remainder of the lots comprised fill sourced from a stockpile of onsite gravel located within Stage 17 (Test Site F) with a maximum dry density (target density) of 2140 kg/m^3 determined by New Zealand Standard Compaction (NZS 4402:1986, Test 4.1.1).

The locations of the test sites across the subdivision and corresponding maximum dry density results are shown on Figure 2 and the compaction curve provided by City Care for the material from Test Sites F is included in Appendix B.

Appendix D

Certification

NZS 4431 : 1989

STATEMENT OF SUITABILITY OF EARTH FILL FOR RESIDENTIAL DEVELOPMENT

To *Selwyn District Council*
PO Box 90
Rolleston 7643

STATEMENT OF SUITABILITY OF EARTH FILL FOR RESIDENTIAL DEVELOPMENT

Subdivision	*CDL – Stonebrook, Rolleston – Stages 14 and 15*
Owner / Developer	*CDL Land New Zealand Ltd*
Location	*Stonebrook Drive, Rolleston*

The earth filling, with depths of fill are shown on the attached plan 224926-DW-LD-S14-AB-CF-01 [A], have been place in compliance with the terms of NZS 4431:1989.

While work was in progress I, Jan Kupec c/- Aurecon NZ Ltd, P O Box 1061, Christchurch, acted as consulting Geotechnical Engineer.

During the work, the inspecting engineer and his staff made periodic visits of inspection to the site. Details of the soil testing carried out to check the quality of the fill by the inspecting engineer can be made available upon request.

The attached plan, 224926-DW-LD-S14-AB-CF-01 [A], shows those lots affected by filling and the extent of the fill as part of the development works.

In the opinion of the inspecting engineer the following special limitations should be observed:

Nil

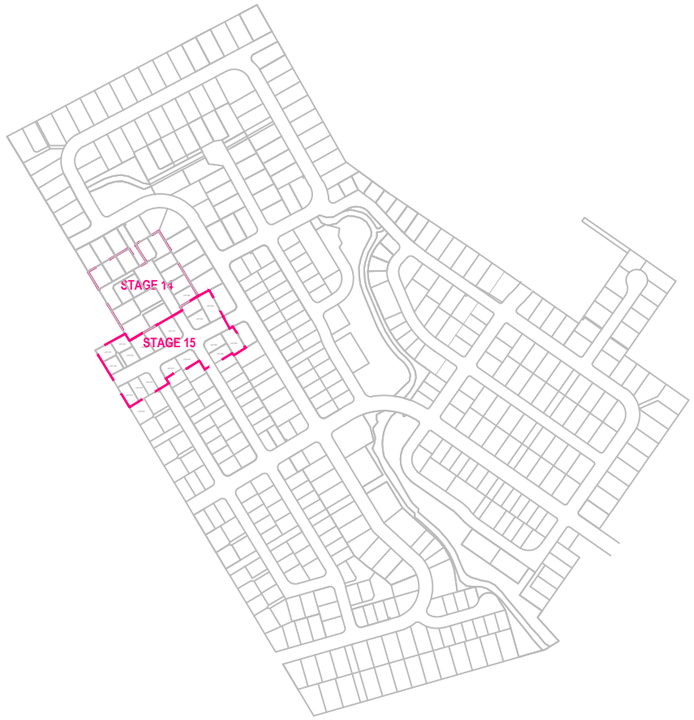
This certification, that the earth fills have been placed in compliance with the terms of NZS 4431:1989 does not remove the necessity for the normal inspection and design of foundations as would be made in natural ground.

..... (signature)

TECHNICAL DIRECTOR (position)

5/5/2015 (date)

On behalf of *CDL Land New Zealand Ltd*



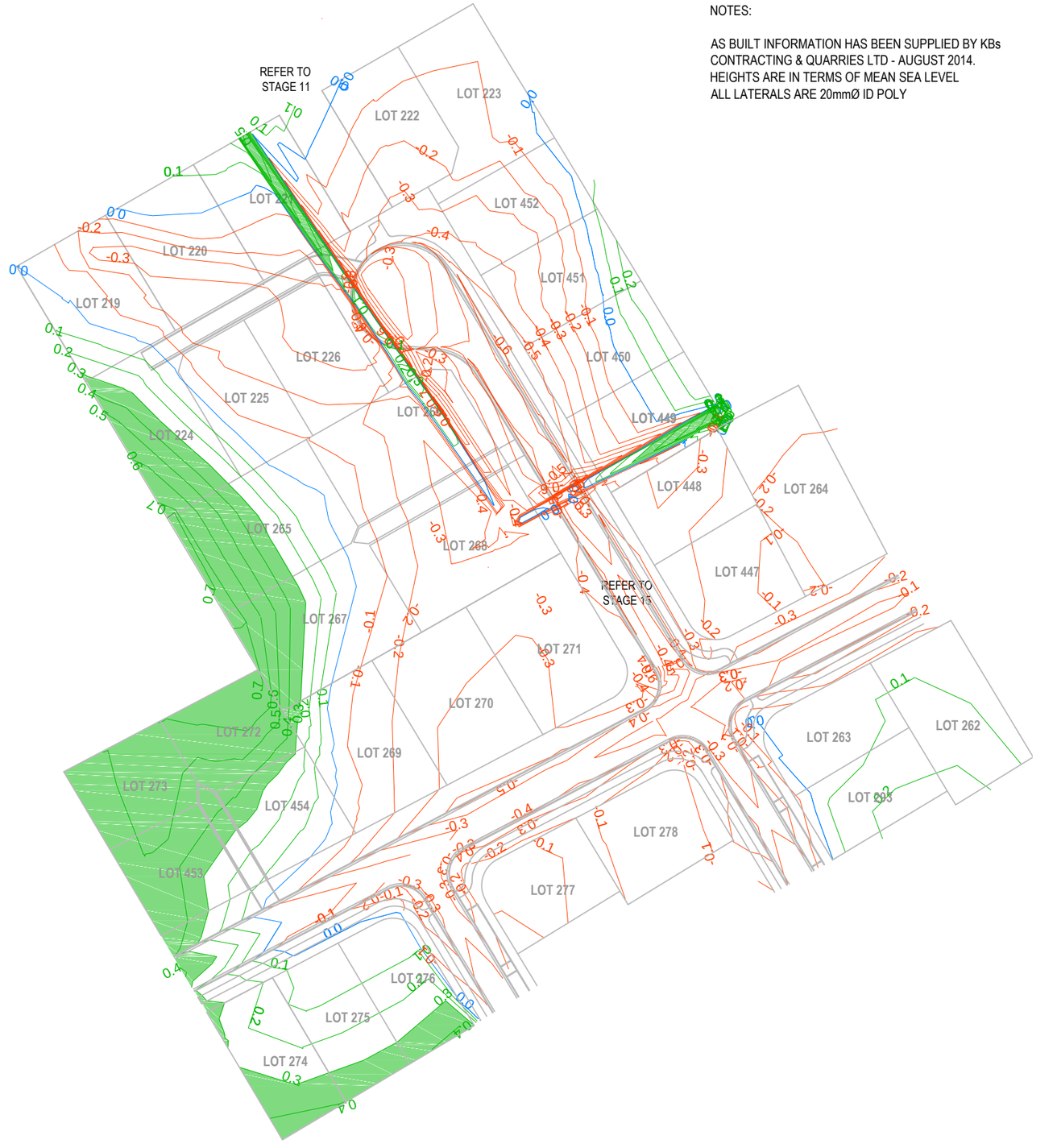
LOCATION PLAN

80 0 160 320m

SCALE 1:8000

NOTES:

AS BUILT INFORMATION HAS BEEN SUPPLIED BY KBs CONTRACTING & QUARRIES LTD - AUGUST 2014.
HEIGHTS ARE IN TERMS OF MEAN SEA LEVEL
ALL LATERALS ARE 20mmØ ID POLY



10 0 20 40m

SCALE 1:1000

00/00/00

CLIENT	REV	DATE	REVISION DETAILS	APPROVED
	A	XX.XX.XX	AS BUILTS ISSUED	B.TOMS

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DRAWN	DESIGNED
A.COLUMBUS	M.CROWE
CHECKED	
D.WATSON	
APPROVED	DATE
B.TOMS	

PROJECT
STONEBROOK ROLLESTON

TITLE
STAGE 14 & 15
CUT FILL
AS BUILT

AS BUILT

PROJECT No.
224926

SCALE	SIZE
AS SHOWN	A3

DRAWING No.	REV
DW-LD-S14-AB-CF-01	A

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